

REMARKS

Claim 19 and non-elected claims 4-6 and 21-25 have been canceled, non-elected claims 26-28 have been withdrawn, and new claims 29-36 have been added. No new matter was added. Accordingly, claims 1-3, 15-18, 20, and 29-36 are pending for further prosecution in the present application, and withdrawn claims 26-28 remain in the application for the possibility of rejoinder. Applicants respectfully submit that independent claim 1, as amended, and new independent claims 30 and 33 are patentable over the prior art of record. Therefore, Applicants respectfully submit that the present application is in condition for allowance.

I. Restriction Requirement

In the Office Action, election of the Group I claims was acknowledged and a new Group III of claims was identified.

Applicants confirm the election of the Group I claims directed to a copper alloy sputtering target containing Al and Si. New claims 29-36 are directed to a copper alloy sputtering target containing Al and Si. Thus, new claims 29-36 fall within Group I.

The Group II claims (4-6 and 21-25) have been canceled.

The Group III claims (26-28) have been withdrawn. Independent product-by-process claim 26 has been amended into dependent form and now depends directly from independent claim 1. Applicants respectfully request rejoinder of claims 26-28 should claim 1 be determined patentable.

II. Claim Objections

In the Office Action, correction of a typographical error in claims 2 and 3 is requested.

Claims 2 and 3 have been amended to correct a typographical error. The unit “ppm” has been replaced with the unit “wtppm”. No new matter was added. For example, see the disclosure on page 5, lines 25-33, of the present application, as filed. Applicants respectfully request removal of the objection.

Further, claim 1 has been amended to include the limitation of claim 19. No new matter was added.

Still further, claims 17 and 20 have been amended to be consistent with the disclosure provided on page 7, lines 28-29, and on page 4, lines 27-28. No new matter was added.

III. Claim Rejections - 35 USC §103(a)

In the Office Action, claims 1-3 and 15-20 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 6,143,427 issued to Andler.

In the Office Action, it is stated that Andler discloses a “Cu based alloy composition (col. 3, lines 60-64) and average grain size (col.3, lines 10-15)”. From this disclosure, it is reasoned that it would be obvious to one of ordinary skill in the art to produce the sputtering target of the present invention. Applicants respectfully disagree and respectfully request reconsideration of this rejection.

More specifically, Applicants respectfully submit that:

(i) Andler fails to teach, disclose or suggest a sputtering target containing Si and fails to provide any motivation for adding Si to its sputtering target or laminate material;

(ii) Andler requires a copper alloy having a significant lead content (30-45wt%) and therefore “teaches away” from the present invention; and

(iii) Andler fails to provide any teaching relative to the grain size of a sputtering target (rather, col. 3, lines 10-15, of Andler refers to the grain size of an overlay (6) deposited on a backing material (2) of a multilayer laminate, not the grain size of the sputtering target).

(i) Andler Fails to Disclose and Obviate the Required Si Content

Andler fails to disclose or obviate a copper alloy sputtering target having the Si content required by independent claims 1, 30, and 33 and as further defined in dependent claims 29, 31 and 35.

The subject matter regarding Si content of new claims 30 and 33 is supported by the disclosure on page 5, lines 19-24, and Examples 1-4 (Table 1, page 10) of the present application, as filed. Accordingly, claims 30 and 33 clearly require an amount of Si content above zero. The subject matter of new dependent claims 29, 31 and 35 is disclosed on page 10, Table 1 for Examples 1-4 of the present application, as filed. Similarly, the subject matter of new dependent claim 34 is disclosed on page 10, Table 1 for Examples 1-4 of the present application, as filed, and the subject matter of new dependent claims 32 and 36 is disclosed on page 8, line 27. Finally, the subject matter of claim 1 is disclosed by “the impurity level” (see page 8, lines 33-35) as indicated on page 10, Table 1 for Example 5. Thus, claim 1 also requires Si content above zero. No new matter was added.

Turning to the Andler patent, it discloses a “multilayer material comprising a bearing material applied directly to a backing material by sputtering, which bearing material comprises a matrix material of copper or a copper-based alloy *with finely dispersed lead inclusions.*” (See column 1, lines 6-10, of Andler.) The disclosed materials have use for “*highly loadable plain*

bearing material in modern combustion engines”, for example, their “considerable strength makes them suitable for use as connecting-rod bearings, main bearings, piston pin bushings, and rocker bushings as well as for use as gear parts or as components in machine construction in general.” (See column 1, lines 13-19, of Andler.)

More specifically, Andler disclose CuPb compositions. (See column 3, line 17, of Andler). Andler requires a lead content of “15-45 wt. %, higher lead contents of from 30-45% wt. % being preferred”. (See column 3, lines 55-59, of Andler.) Further, Andler discloses a sputtering target “exhibiting the composition of the resultant over-lay (e.g. CuPb₃₀Sn).” (See column 5, lines 1-2, of Andler.)

There is no disclosure, teaching, or suggestion in Andler of providing a copper alloy sputtering target with Si content. Further, due to the great difference between plain bearings for use in the combustion engine industry and the semiconductor wiring of the present application, one of ordinary skill in the art is provided with no common sense motivation for adding Si to the CuPb compositions of Andler.

In contrast with Andler, the present invention relates to a copper alloy sputtering target for forming semiconductor wiring, and more specifically, to a sputtering target used for the formation of a seed layer that is stable, uniform and free from the occurrence of coagulation during copper electroplating. (See the present application, as filed, on page 1, lines 9-14.) According to the present invention, an amount of Si is included in the copper alloy sputtering target for the purpose of improving oxidation resistance. (See the present application, as filed, on page 5, lines 19-24.) Examples 1-4 of the present invention disclose Si contents of 0.19, 0.21, 0.33 and 0.41 wtppm. (See the present application, as filed, on page 10, Table 1.) More than 0.5wtppm of Si should be avoided because it will “deteriorate the coagulation prevention effect” of the present invention. (See the present application, as filed, on page 5, lines 19-24.)

Andler clearly fails to disclose anything with respect to semiconductor wiring, coagulation of seed layers, or the like. Accordingly, Andler clearly fails to disclose the Si content required by independent claims 1, 30 and 33 and dependent claims 29, 31 and 35 of the present application and fails to obviate such use.

Accordingly, for at least this reason, Applicants respectfully submit that claims 1-3, 15-18, 20 and 29-36 are patentable over the Andler patent. Thus, Applicants respectfully request reconsideration and removal of the rejection.

(ii) Andler Requires Significant Lead Content

As discussed above, the composition and sputtering target of Andler requires lead content of “15-45 wt. %, *higher lead contents of from 30-45% wt. % being preferred*”. (See column 3, lines 55-59, of Andler.) Further, Andler discloses a sputtering target “exhibiting the composition of the resultant over-lay (e.g. CuPb₃₀Sn).” (See column 5, lines 1-2, of Andler.)

“Teaching away” is the antithesis of the art suggesting that the person of ordinary skill in the art go in the claimed direction. Essentially, “teaching away” is a per se demonstration of lack of obviousness. In re Fine, 873 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

The copper alloy sputtering target of the present application does not include lead. As a general rule which would be well known to one of ordinary skill in the art, radioactive elements such as lead are eliminated as much as possible from metallic material used to form semiconductor devices. This is because, since a part of the isotope of lead is a radioactive element, if copper alloy containing lead is used in the wiring of a semiconductor memory or the like, rays will be emitted as radiation and cause soft errors. Thus, no lead is present in the sputtering target of the present invention. (See, for instance, claims 30 and 33 of the present application which are written in the closed-ended “consisting of” terminology. No new matter

was added; for example, see page 8, lines 27-32, and page 10, Table 1, Examples 1-4 of the present application, as filed.)

Thus, the requirement of up to 45wt% of lead in the sputtering target of Andler teaches one of ordinary skill in the art away from the present invention in which no lead is present nor can be present if the semiconductor is expected to function properly. Accordingly, Applicants respectfully submit that the claims of the present application are patentable and are not obviated by Andler because Andler requires up to 45wt% of lead.

Further, when a §103 rejection is based upon a modification of a reference that destroys the intent, purpose or function of the invention disclosed in the reference, such a proposed modification is not proper and a *prima facie* case of obviousness cannot be properly made. In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

It is clear from the disclosure of Andler that 30 to 45wt% of lead content is required “in order to obtain a *sufficiently thick, lead-rich layer on the surface of the bearing material.*” (See column 3, lines 55-59, of the Andler patent.) Accordingly, removing the lead content from the sputtering target of Andler would clearly destroy the intent, purpose or function of the plain bearing disclosed by Andler. Thus, it cannot be obvious to one of ordinary skill in the art to modify Andler such that it has no lead content.

For these reasons, Applicants respectfully submit that claims 1-3, 15-18, 20 and 29-36 are patentable over the Andler patent. Thus, Applicants respectfully request reconsideration and removal of the rejection.

(iii) Andler Fails to Disclose the Claimed Grain Size

On column 3, lines 10-15, Andler discloses the average grain diameter *of a multilayer bearing material*. In contrast, the claims of the present application require a specific average

crystal grain size and variation *of the target itself*, not the deposited film or coating. Andler clearly fails to provide a teaching of the grain size of the sputtering target that is only vaguely referenced on column 5, lines 1-2, of Andler.

Accordingly, Applicants respectfully submit that Andler fails to disclose or obviate the grain size limitations required *of the sputtering target* by the claims of the present application. Applicants respectfully request reconsideration and removal of the rejection.

IV. Claim Rejections – Double Patenting

In the Office Action, claims 1-3 and 15-20 are provisionally rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 3, 4, 7, 8, 16-19, 23, 24 and 27 of co-pending application No 10/501,117.

A Terminal Disclaimer is being filed with respect to co-pending application No. 10/501,117. Accordingly, Applicants respectfully request reconsideration and removal of the rejection.

V. Conclusion

In view of the above amendments, remarks and Terminal Disclaimer, Applicants respectfully submit that the claim rejections have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Amendment to our deposit account no. 08-3040.

Respectfully submitted,
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